WHAT IS CLAIMED IS:

1. An optical recording medium comprising at least one optical recording layer, the optical recording layer including an optical recording material that changes a state of photo-induced birefringence in response to recording light, a portion of the recording layer that changes a state of photo-induced birefringence substantially acting optically as a half-wave plate.

2. The optical recording medium as claimed in Claim 1, wherein said optical recording layer substantially satisfies:

$$\Delta n \bullet d = (m+1/2) \bullet \lambda$$

where Δn is a refractive index change induced by recording light, d is a thickness of the optical recording layer, λ is the wavelength of reproducing light and m is an integer.

3. The optical recording medium as claimed in Claim 1, wherein the photo-induced birefringence is caused by a refractive index change Δn induced by recording light, and the refractive index change Δn is a saturated refractive index change value when a recording light irradiation amount is greater than a saturation light amount.

4. The optical recording medium as claimed in Claim 1, wherein said optical recording material comprises a polymer or a liquid crystal polymer in which a side chain includes a group which is photoisomerized.

5. The optical recording medium as claimed in Claim 4, wherein said polymer or said liquid crystal polymer contains an azobenzene skeleton.

6. The optical recording medium as claimed in Claim 4, wherein said polymer or liquid crystal polymer comprises at least one kind of monomer-polymer selected from a polyester group.

7. The optical recording medium as claimed in Claim 1, wherein said optical recording layer comprises a polymer in which photoisomerized molecules are dispersed.

8. The optical recording medium as claimed in Claim 7, wherein said polymer contains an azobenzene skeleton.

9. The optical recording medium as claimed in Claim 7, wherein said polymer comprises at least one kind of monomer selected from polyesters.

10. The optical recording medium as claimed in Claim 1, wherein said optical recording layer has a disk shape.

11. An optical recording medium comprising:

at least one optical recording layer including an optical recording material that changes a state of photo-induced birefringence in response to recording light, a portion of the recording layer that changes a state of photo-induced birefringence substantially acting optically as a quarter-wave plate; and

an optical reflection layer formed on one surface of said optical recording layer.

12. The optical recording medium as claimed in Claim 11, wherein said optical recording layer substantially satisfies:

$$\Delta n \bullet d = (m+1/4) \bullet \lambda$$

where Δn is a refractive index change induced by recording light, d is a thickness of the optical recording layer, λ is a wavelength of reproducing light, and m is an integer.

13. The optical recording medium as claimed in Claim 11, wherein the photo-induced birefrengence is caused by a refractive index change Δn induced by recording light, and the refractive index change Δn is a saturated refractive index change value when a recording light irradiation amount is greater than a saturation light amount.

14. The optical recording medium as claimed in Claim 11, wherein said optical recording material comprises that a polymer or a liquid crystal polymer in which a side chain includes a group that is photoisomerized.

15. The optical recording medium as claimed in Claim 14, wherein said polymer or said liquid crystal polymer contains an azobenzene frame.

16. The optical recording medium as claimed in Claim 14, wherein said polymer or said liquid crystal polymer comprises at least one kind of monomer-polymer selected from a polyester group.

17. The optical recording medium as claimed in Claim 11, wherein said optical recording layer comprises a polymer in which photoisomerized molecules are dispersed.

18. The optical recording medium as claimed in Claim 17, wherein said polymer contains an azobenzene frame.

19. The optical recording medium as claimed in Claim 17, wherein said polymer comprises at least one kind of monomer-polymer selected from a polyester group.

20. The optical recording medium as claimed in Claim 11, wherein said optical recording layer has a disk shape.

21. An optical recording medium comprising an optical recording layer that includes a material in which an azimuth of birefringence that is induced by recording light changes in response to a rotation of a polarization angle of said recording light.

22. An optical recording method comprising:

controlling a polarization angle of recording light emitted from a light source; and

forming an optical element, that acts substantially as a half-wave plate, having an azimuth corresponding to said polarization angle on an optical recording medium by illuminating said optical recording medium with said recording light.

23. The optical recording method as claimed in Claim 22, wherein said step of controlling said polarization angle comprises directing said recording light emitted from said light source to a polarization rotary device.

24. The optical recording method as claimed in Claim 22, wherein said step of forming said optical element comprises rotating a disk-like optical recording medium and directing said recording light along a diameter direction of said optical recording medium.

25. The optical recording method as claimed in Claim 22, wherein said optical element is formed in a position at least partially coextensive with an existing optical element in said optical recording medium.

26. An optical recording method comprising:

controlling a polarization angle of recording light emitted from a light source; and

forming an optical element, that acts substantially as a quarter-wave plate, having an azimuth corresponding to said polarization angle on an optical recording medium by illuminating said optical recording medium with said recording light.

27. The optical recording method as claimed in Claim 26, wherein said step of controlling said polarization angle comprises directing said recording light emitted from said light source to a polarization rotary device.

28. The optical recording method as claimed in Claim 26, wherein said step of forming said optical element comprises rotating a disk-like optical recording

medium and directing said recording light along a diameter direction of said optical recording medium.

29. The optical recording method as claimed in Claim 26, wherein said optical element is formed in a position at least partially coextensive with an existing optical element in said optical recording medium.

30. An optical recording apparatus comprising:

a light source that generates recording light;

a spatial optical modulator that controls a polarization angle of said recording light; and

a focusing optical system that directs recording light obtained through said spatial optical modulator to an optical recording medium.

31. The optical recording apparatus as claimed in Claim 30, wherein said spatial optical modulator controls a polarization angle of said recording light in response to recording information.

32. The optical recording apparatus as claimed in Claim 30, wherein said spatial optical modulator is a polarization rotary device.

33. The optical recording apparatus as claimed in Claim 30, further comprising:

a medium driving mechanism that rotates said optical recording medium; and

a head moving mechanism that moves an optical recording head including said light source, said spatial optical modulator, and said focusing optical system, in a diameter direction relative to said optical recording medium.

34. The optical recording apparatus as claimed in Claim 30, further comprising said optical recording medium.

35. An optical recording medium comprising an optical recording layer including an optical recording material that stores multilevel information using a light induced birefringence that acts optically as a half-wave plate, an orientation of an azimuth of birefringence formed by recording light representing the multilevel information.

36. The optical recording medium as claimed in Claim 35, wherein said optical recording layer has a disk shape.

37. An optical recording medium comprising an optical recording layer including an optical recording material that stores multilevel information using a light induced birefringence that acts optically as a quarter-wave plate, an orientation of an azimuth of birefringence induced by recording light representing the multilevel information.

38. The optical recording medium as claimed in Claim 37, wherein said optical recording layer has a disk shape.

39. An optical recording medium comprising an optical recording layer in which an azimuth of birefringence induced by recording light is multilevel-modulated and recorded in response to a rotation of a polarization angle of said recording light.

40. An optical reproducing method comprising:

radiating reproducing light on an optical recording medium in which an azimuth of an optical element that acts substantially as a half-wave plate is multilevel recorded in response to a polarization angle of recording light; and

determining a polarization angle of reproducing light transmitted by said optical element.

41. The optical reproducing method as claimed in Claim 40, wherein said reproducing light has a light intensity smaller than that of said recording light.

42. The optical reproducing method as claimed in Claim 40, wherein said step of determining said polarization angle comprises of rotating said optical recording medium and said step of radiating comprises radiating said reproducing light along a diameter direction of said optical recording medium.

43. An optical reproducing method comprising:

radiating reproducing light on an optical recording medium in which an azimuth of an optical element that acts substantially as a quarter-wave plate is multilevel-recorded in response to a polarization angle of recording light; and

determining a polarization angle reproducing light reflected from said optical element.

44. The optical reproducing method as claimed in Claim 43, wherein said reproducing light has a light intensity smaller than that of said recording light.

45. The optical reproducing method as claimed in Claim 43, wherein said step of determining said polarization angle comprises rotating said disk-like optical

recording medium and said step of radiating comprises radiating said reproducing light along a diameter direction of said optical recording medium.

46. An optical reproducing apparatus comprising:

a reproducing light optical system for transmitting reproducing light to an optical recording medium in which an azimuth of an optical element that acts substantially as a half-wave plate is multilevel recorded in response to a polarization angle of recording light; and

an analyzing unit that detects a polarization angle of reproducing light transmitted by said optical element.

47. The optical reproducing apparatus as claimed in Claim 46, further comprising:

a medium driving mechanism that rotates said optical recording medium; and

a head moving mechanism that moves an optical reproducing head including said reproducing light optical system and said analyzing unit, along a diameter direction of said optical recording medium.

48. The optical reproducing apparatus as claimed in Claim 46, further comprising said optical recording medium.

49. An optical reproducing apparatus comprising:

a reproducing light optical system for emitting reproducing light toward an optical recording medium in which an azimuth of an optical element that acts substantially as a quarter-wave plate is multilevel recorded in response to a polarization angle of recording light; and

an analyzing unit that detects a polarization angle of reproducing light reflected by an optical reflection layer and transmitted by said optical element.

50. The optical reproducing apparatus as claimed in Claim 49, further comprising:

a medium driving mechanism that rotates said optical recording medium;

a head moving mechanism that moves an optical reproducing head including said reproducing light optical system and said analyzing unit, along a diameter direction of said optical recording medium.

51. The optical reproducing apparatus as claimed in Claim 49, further comprising said optical recording medium.

52. An optical recording and reproducing apparatus comprising:

a light source that generates recording light;

a polarization rotary device that ~~controls~~ rotates a polarization angle of said recording light;

a focusing optical system that irradiates an optical recording medium with recording light obtained from said polarization rotary device;

a reproducing light optical system that irradiates said optical recording medium with reproducing light; and

an analyzing unit that detects a polarization angle of reproducing light acted on by said optical recording medium.

53. A method for optically recording and reproducing information, comprising:

controlling a polarization angle of recording light emitted from a light source;

forming an optical element having an azimuth corresponding to said polarization angle on an optical recording medium by illuminating said optical recording medium with said recording light;

radiating reproducing light on the optical recording medium; and

determining a polarization angle of reproducing light acted on by said optical element.

54. A device for optically recording and reproducing information, comprising:

controlling means for controlling a polarization angle of recording light emitted from a light source;

forming means for forming an optical element having an azimuth corresponding to said polarization angle on an optical recording medium by illuminating said optical recording medium with said recording light;

illumination means for radiating reproducing light on the optical recording medium; and

determining means for determining a polarization angle of reproducing light acted on by said optical element.

55. An optical recording medium comprising an optical recording layer in which an optical element is formed, the optical element having an azimuth of birefringence and acting on reproducing light to adjust a polarization angle of the reproducing light by an amount greater than a difference between a polarization angle of recording light used to form the optical element and a polarization angle of the reproducing light before the reproducing light is acted on by the optical element.